CMPSC265 Data Structures and Algorithms
Homework 6

Due: Sunday, Oct 13th, 2019, 11:59pm

Learning Objectives
- Recursion
- Merge Sort

Deliverables:
- The modified java file *ReverseLinkedList.java* for Problem 1
- The modified java file *StringConstruction.java* for Problem 2
- The Java File *MergeSort3Way.java* for Problem 3

Instructions:
- Please first download the Java source file for problems 1 and 2, modify the codes based upon requirements, and submit the updated source file. Please do NOT change the provided part of the codes, but you may add additional methods if needed.
- Please add the required *credit comments* and *comments* to each Java program you submit.

Problem Specifications:

Problem 1: ReverseLinkedList class (30')

Description:
Please use a recursive approach to reverse a given linked list.

Example:
Given a linked list: 1->2->3->4->5
After reversing the linked list, we have:
5->4->3->2->1

Outputs:
Your output should look something like follows.

```
$ java ReverseLinkedList
List (first-->last): {5} {4} {3} {2} {1}
List (first-->last): {1} {2} {3} {4} {5}
```

Problem 2: *String Construction (30')*
Description:
Given a set of characters and a positive integer k, print all possible strings of length k that can be formed from the given set. Please implement it using recursion.

Examples:
Input:
char[] = {'a', 'b'}, k = 3
Output:
aaa
aab
aba
abb
baa
bab
bba
bbb

Input:
char[] = {'a', 'b', 'c', 'd'}, k = 1
Output:
a
b
c
d

Outputs:
As shown above.

Problem 3: MergeSort3Way class (40)

Description:

Instead of dividing into half at each step, you are now supposed to divide recursively the initial array into thirds, sort each third, and then combine using a 3-way merge.

Please implement a MergeSort3Way class so that arrays can be sorted by using Merge Sort 3-Way.

Please read the numbers from the attached *largeW.txt* file into an array, apply the 3-way sorting, and output the sorted results into a file *largeWResults.txt*